*Bull. nat. Hist. Mus. Lond.* (Bot.) **30**(1): 7–11 Issued 29 June 2000

# Three new species of *Pilea* (Urticaceae) from Costa Rica and Panama

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**SYNOPSIS.** Three new species of *Pilea* from Mesoamerica are described and illustrated: *P. conjugalis* A.K. Monro from Costa Rica and Panama which most closely resembles *P. pittieri* Killip, *P. adamsiana* A.K. Monro from Panama which most closely resembles *P. pallida* Killip, and *P. trichomanophylla* A.K. Monro, also from Panama, which is unique within the genus in having pinnately lobed isomorphic leaves. The affinities of these species are discussed and their position within Weddell's subdivisions of the genus indicated.

## INTRODUCTION

*Pilea* is the largest genus within the Urticaceae and one of the larger genera in the Urticales. It is distributed throughout the tropics, subtropics and temperate regions (with the exception of Australia, New Zealand and Europe) and easily distinguished from other Neotropical Urticaceae by the combination of opposite leaves and a single ligulate intrapetiolar stipule in each leaf axil. Most of the species are small shade-loving forest herbs, many of which are facultatively epiphytic or epipetric.

The last comprehensive treatment of the genus was that of Weddell (1869), in which 159 species and three species groups, *Integrifoliae*, *Heterophyllae* and *Dentatae,* were recognized. Since that time many new species have been described; *Index Kewensis* (Anon., 1997) lists 813 species names worldwide, and estimates for the number of species range from 500 (Adams, 1970) to 600 (Burger, 1977). Subsequent to Weddell's 1857 and 1869 revisions, the majority of contributions to the taxonomy of the genus have come from flora treatments, with major additions to neotropical *Pilea* made by Killip (1936, 1939), Standley & Steyermark (1952), Adams (1972), and Burger (1977).

While preparing a revisionary account of *Pilea* for *Flora Mesoamericana,* 2042 collections from Central and South America were examined and seven new species described by the author (Monro, 1999). A further three new species are identified here. In the absence of a phylogenetic analysis of *Pilea*, the position of the new taxa in relation to Weddell's species groups is indicated after each species description.

**Pilea conjugalis** A.K. Monro, **sp. nov.** Type: Panama, Chiriquí, humid forest between Alto de las Palmas and top of Cerro de la Horqueta, 2100–2268 m, 18 March 1911, *Pittier* 3230 (NY!-holotype).
Fig. 1.

Species *P. pittieri* Killip similis, sed floribus staminatis minimis, stipulis minimis, fructibus maioribus, differt.

*Herb* to 60 cm, perennial; terrestrial, monoecious. *Stems* erect, branched, rooting at the base; internodes 9–55 × 0.8–4.0 mm, weakly striate, drying dark brown to black, glabrous, without cystoliths. *Stipules* 1.0–2.5 × 1.0–1.5 mm, deltate, membranous, brown, persistent. *Laminas of leaves* at the same node unequal in length by ratio 1:1.5–3.0, petiolate, the major leaves 32–121 × 10–40 mm, elliptic to ovate, subchartaceous to chartaceous; adaxial surface drying brown to dark brown, glabrous, cystoliths fusiform, occasionally elliptic; abaxial surface drying brown to grey-brown, glabrous, cystoliths fusiform and occasionally disc-shaped, punctate-glandular; base asymmetrical or symmetrical, acute, obtuse or subcordate; margin serrate, frequently denticulate towards the apex of the lamina, with basal $^1/_5$ to $^1/_8$ entire; apex symmetrical, acuminate; primary venation 3-veined, the two lateral veins stopping short of the lamina apex, secondary veins 12–39 pairs, 75–90° to the midrib; the minor leaves 16–52 × 8–20 mm, otherwise as major leaves. *Inflorescences* 6–20 per stem, bisexual or unisexual, where bisexual dominated by one sex; peduncle and pedicels subtended by stipuliform bracts, the peduncular bracts 1.0–1.5 mm, ovate, the pedicellular bracts 0.4–0.5 mm, narrowly deltate to subulate. *Staminate and staminate-dominated inflorescences* solitary, 12–68 mm, bearing 15–300 flowers in a loose panicle; peduncle $^1/_3$ to $^2/_3$ inflorescence length, 0.5–0.8 mm in diameter, glabrous; pedicels 0.5–0.8 × 0.2–0.3 mm, glabrous; flowers in bud immediately prior to anthesis 1.0–1.5 × 0.8–1.5 mm, pale brown; tepals 4, *c.* 1.0–1.5 mm, elliptic to obovate, glabrous, the subapical appendages 0.3–0.5 mm, ridge-like, glabrous; stamens 4, filaments 1.3–1.8 mm, anthers 0.8–1.0 × 0.5–1.0 mm. *Pistillate and pistillate-dominated inflorescences* solitary, 29–33 mm, bearing 44–100 flowers in a loose panicle; peduncle $^1/_3$ to $^2/_3$ inflorescence length, 0.5 mm in diameter, glabrous; pedicels 0.2–0.5 × 0.2 mm, glabrous; flowers 0.7–1.0 × 0.4–0.5 mm, glabrous; tepals 3, unequal, glabrous, the central one 0.5–0.8 mm, oblong to obovate, with a dorsal appendage, the lateral two, 0.5–0.8 mm, asymmetrically ovate, each with a dorsal appendage. *Infructescences* 24–70 × 0.5–0.8 mm; fruit 1.8–2.0 × 1.3–1.5 mm, asymmetrical, compressed elliptic to ovoid, cream to pale brown, the ventral margin broadest at the apex, the dorsal margin narrow, thickened.

DISTRIBUTION. North and central Costa Rica and western Panama at 1500–2300 m, in premontane and montane wet forest.

MATERIAL EXAMINED.
**COSTA RICA. Alajuela**: Atlantic side of Alto Palomo, 1900 m, *Lent* 1818 (F). **Cartago**: *c.* 15 km S. of Tapantí along the new road, on E. slope above Río Grande de Orosi near the concrete bridge, 09°42'N 83°47'W, 1500 m, *Burger & Liesner* 6799 (F, MO); Tapantí Reserve, 1400–1700 m, *Gómez* 19272 (BM); *c.* 6 km S. of Cartago by air, Quebrada Cangreja, 3 km S. of Pan American Highway, 09°46'N 83°57'W, 1620–1650 m, *Liesner & Judziewicz* 14487 (BM); N. and S. slopes of ridge on eastern side of Río Grande de Orosi, opposite mouth of Río Humo, *c.* 6 km upstream from Tapantí, 09°43'N 83°47'W, 1500–1800 m, *Grayum* et al. 4532 (BM); *c.* 15 km S. of Tapantí along the new road, on E. slope above Río Grande de Orosi near the concrete bridge, 09°42'N 83°47'W, 1500 m, *Burger & Gentry* 9192 (F); *c.* 10 km S. of Tapantí along the new road on E. slope above Río Grande de Orosi, 09°42'N

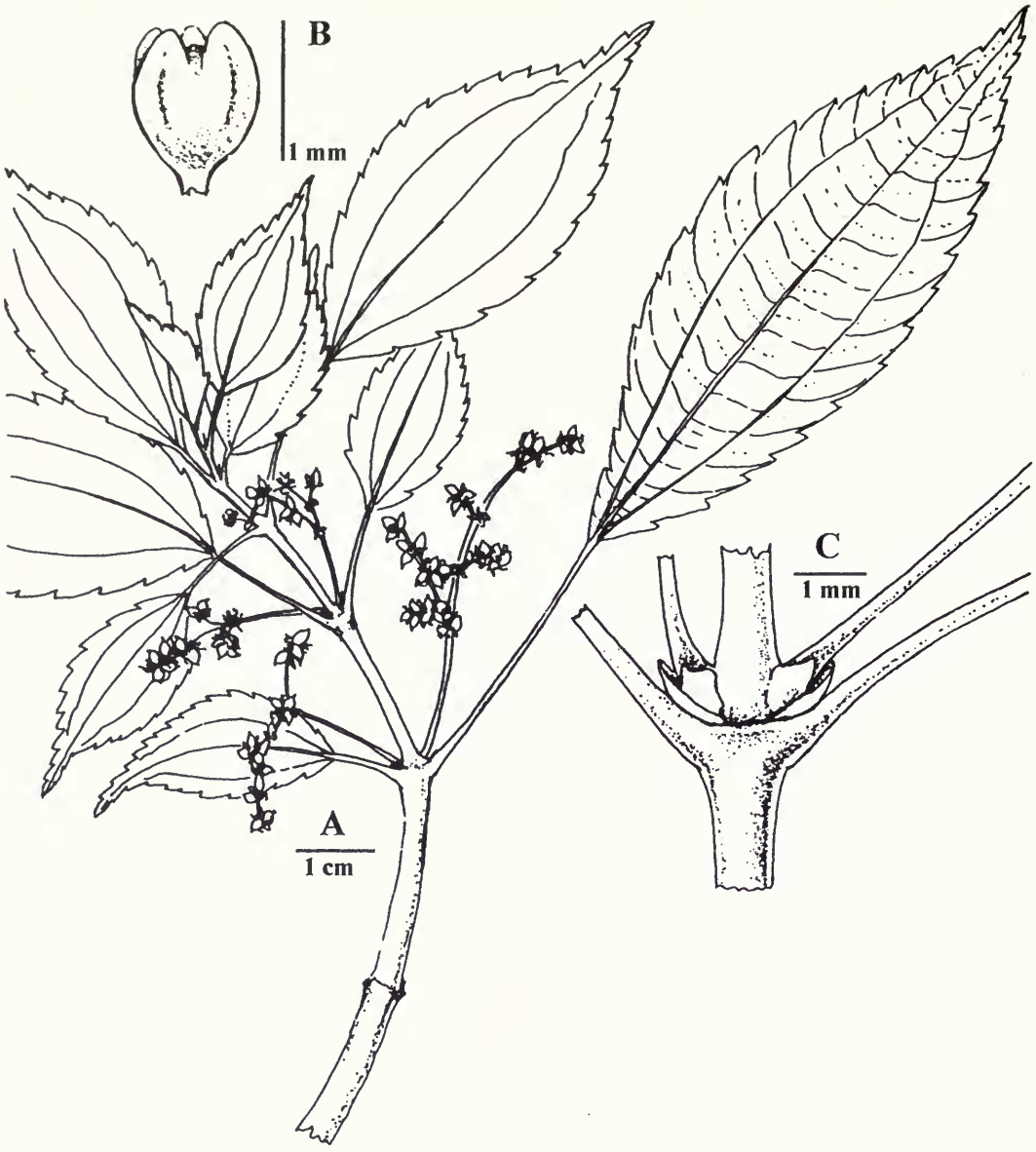


**Fig. 1** *Pilea conjugalis* (*Pittier* 3230, NY). A. Fertile branch with infructescences, B. Staminate flower immediately prior to anthesis, C. Stipules.

83°47'W, 1400–1600 m, *Burger & Stolze* 5715 (F); *c.* 10 km S. of Tapantí along the new road on E. slope above Río Grande de Orosi, 09°42'N 83°46'W, 1600 m, *Burger & Burger* 7568 (BM, F). **Heredia**: saddle between Volcán Barva and Volcán Irazu, headwaters of Río Patria, 2200 m, *Godfrey* 66148a (MO); ridges and steep slopes along the Río Para Blanca, Cerros de Zurqui, 10°03'N 84°01'W, 1600–1800 m, *Burger* et al. 10244 (F, MO); Río Vueltas (upper Río Patria) on E. slope of Volcán Barva on Caribbean side of continental divide, 10°06'N 84°04'W, 1900 m, *Burger & Gentry* 9029 (F, MEXU, NY); road between San Rafael and Río Las Vueltas, along Río Patria above bridge, 10°05'N 84°04'W, 2020–2040 m, *Stevens* 13929 (BM, MO); along headwaters of Río Santo Domingo, *c.* 3 km E. of San Rafael de Vara Blanca, N. slope of Volcán Barva, 10°11'N 84°07'W, 2060 m, *Grayum* 7106 (BM); Río Vueltas (upper Río Patria), E. slope of Volcán Barva near continental divide, 10°06'N 84°04'W, 2000 m, *Barringer & Christenson* 3379 (F); base of Cerro Zurquí, 10°03'N 84°02'W, 1600 m, *Lent* 3572 (F).

**PANAMA**. **Chiriquí**: Cerro Pata de Macho, *c.* 5 miles NE of Boquete, trail to continental divide leading to Finca Serrano, *Antonio* 2638 (MO); 7 km NW of Cerro Punta, Las Nubes region, 7200 ft, *Hammel* 1439 (MO); trail to Cerro Pate Macho, headwaters of Río Palo Alto, above Palo Alto, 1700–2100 m, 08°47'N 82°22'W, *Knapp* et al. 4256 (MO); *c.* 0.5 km E. of Cerro Pate Macho, headwaters of Río Palo Alto, 08°47'N 82°21'W, 1800–2100 m, *Knapp* et al. 2114 (MO); above Guadalupe, *c.* 2 km N. of Cerro Punta, 2200 m, 08°53'N 82°33'W, *Maas & Dressler* 4842 (F); vicinity of Las Nubes, 2.7 miles NW of Río Chiriquí Viejo W. of Cerro Punta, 2200 m, *Croat* 22383 (GH).

This species falls into Weddell's *Heterophyllae* species group (with leaves of unequal length at each node). *Pilea conjugalis* most closely resembles *P. pittieri* Killip from Costa Rica. It may be distinguished from the latter by stipule shape and size, staminate inflorescence arrangement, and staminate and pistillate flower morphology, as summarized below.

*Pilea pittieri*: stipules 3–18 mm, oblong or obovate, caducous;

staminate flowers borne in 1–5 compact heads, the flowers 2–3 mm; fruit 0.8–1.5 mm.

*Pilea conjugalis*: stipules 1.0–2.5 mm, deltate, persistent; staminate flowers borne in a loose panicle, the flowers 1.0–1.5 mm; fruit 1.8–2.0 mm.

Many collections of *Pilea conjugalis* have been identified as *P. gracilipes* Killip, a species ranging from southern Mexico to northern South America. Although there is a similarity in leaf shape and margin, *P. gracilipes* differs in stem colour, leaf isomorphy, staminate inflorescence arrangement. and fruit size, as summarized below.

*Pilea gracilipes*: stem drying grey-green to green; leaves of equal or subequal length at each node, where subequal by a ratio less than 1:1.5; staminate flowers borne in a compact head; fruit 1.3–1.5 mm.

*Pilea conjugalis*: stem drying dark brown to black; leaves of unequal length at each node by ratio 1:1.5–3.0; staminate flowers borne in a loose panicle; fruit 1.8–2.0 mm.

The species epithet refers to the presence of both male and female flowers on the majority of the inflorescences encountered, an infrequent, although not rare, occurrence in the genus *Pilea*.

**Pilea adamsiana** A.K. Monro, **sp. nov.** Type: Panama, Veraguas, mountains west of Alto de Piedras Junior High School north of Santa Fe, Cerro Arizona (highest peak visible west of school), 1000–1450 m, 11 September 1978, *Hammel* 4702 (MO!-holotype).
Fig. 2A–C.

Species *P. pallida* Killip similis, sed habitu epiphytico, folii margine discrete crenulato, fructibus maioribus, differt.

*Shrublet* or *herb* to 30 cm, perennial; epiphytic, monoecious. *Stems* repent, sparsely branched, rooting at the base and adventitiously; internodes 6–34 × 1.8–4.0 mm, weakly striate, drying dark brown to grey-brown, glabrous, cystoliths fusiform. *Stipules* 1.5–3.5 × 1.0–1.5 mm, deltate, membranous to subchartaceous, grey to brown, persistent. *Laminas of leaves* at the same node of equal length or subequal, petiolate, 23–115 × 8–27 mm, oblanceolate or obovate, chartaceous to subcoriaceous; adaxial surface drying dark brown, glabrous, cystoliths fusiform, rarely 'V'-shaped; abaxial surface drying red-brown or grey-brown, glabrous, cystoliths fusiform, disc-shaped, rarely 'V'-shaped, punctate-glandular; base symmetrical, cuneate, occasionally weakly subcordate; margin crenulate, basal $^2/_3$ to $^3/_4$ entire; apex symmetrical, cuspidate; primary venation 3-veined, the two lateral veins stopping short of the lamina apex, secondary veins 7–33 pairs, 75–90° to the midrib; petioles equal or subequal, 7.5–25 × 0.8–1.8 mm, glabrous. *Inflorescences* 2–16 per stem, unisexual, pistillate inflorescences preceding staminate inflorescences; peduncle and pedicels subtended by stipuliform bracts, the peduncular bracts 1.3–2.0 mm, deltate, the pedicellular bracts 0.5–1.0 mm, narrowly deltate to subulate. *Staminate inflorescences* 1–2 per axil, 15–35 mm, bearing 60–200 flowers in a single compact head; peduncle $^1/_2$ to $^2/_3$ inflorescence length, 0.5–0.8 mm in diameter, glabrous; pedicels 1.0–4.0 × 0.3–0.4 mm, glabrous; flowers in bud immediately prior to anthesis 2.5–3.5 × 0.8–1.3 mm, brown; tepals 4, 3–4 mm, elliptic, glabrous, the subapical appendages 1.5–2.0 mm, narrowly oblong to elliptic, frequently reflexed, glabrous; stamens 4, filaments 1.5–2.5 mm, anthers 1.0 × 1.0 mm. *Pistillate inflorescences* 1–2 per axil, *c.* 7 mm, bearing 24–40 flowers in a semi-compact panicle; peduncle $^1/_2$ to $^2/_3$ inflorescence length, *c.* 0.5 mm in diameter, glabrous; pedicels *c.* 0.8 × *c.* 0.4 mm, glabrous; flowers *c.* 1.3 × *c.* 0.8 mm, glabrous; tepals 3, unequal, the central one *c.* 1.0 mm, oblong to spatulate, not dorsally thickened, the lateral two *c.* 0.8 mm, oblong to spatulate, not dorsally thickened. *Infructescences* 12–26 × 0.5–0.8 mm; fruit 1.8–2.3 × 1.3–1.4 mm, asymmetrical, compressed, elliptic, pale brown to brown, the ventral margin broadest towards the apex and flattened, the dorsal margin narrow, thickened.

DISTRIBUTION. Known only from the Cerro Tute in Veraguas, western Panama, at an altitude of 1300–1500 m, growing on tree branches in premontane and montane wet forest.

MATERIAL EXAMINED.
**PANAMA. Veraguas**: vicinity of Escuela Agricultura Alto Piedra near Santa Fe, trail to top of Cerro Tute, 1400 m, *Antonio* 2010 (MO); vicinity of Escuela Agricultura Alto Piedra near Santa Fe, trail to top of Cerro Tute, 1400 m, *Antonio* 2014 (MO); Cerro Tute ridge up from former escuela Agrícola, Santa Fe, 08°35'N 81°05'W, 1400–1450 m, *Hamilton & Krager* 4010 (MO).

This species falls within Weddell's *Integrifoliae* species group (with leaves of equal length at each node and entire margins). *Pilea adamsiana* A.K. Monro most closely resembles *P. pallida* Killip from Costa Rica and Panama. It may be distinguished from the latter by its habit, leaves, indumentum, staminate inflorescence, and fruit, as summarized below.

*Pilea pallida*: terrestrial; leaves ovate, falcate, lanceolate; leaf margin prominently serrate, basal $^1/_5$ to $^1/_3$ of the leaf entire; staminate peduncle $^1/_8$ inflorescence length; fruit 0.8–1.0 mm.

*Pilea adamsiana*: epiphytic; leaves oblanceolate or obovate; leaf margin discretely crenulate, basal $^2/_3$ to $^3/_4$ of the leaf entire; staminate peduncle $^1/_2$ to $^2/_3$ inflorescence length; fruit 1.8–2.3 mm.

*Pilea adamsiana* is named after C.D. Adams, whose previous work on the genus and assistance with the *Flora Mesoamericana* account have proved invaluable.

**Pilea trichomanophylla** A.K. Monro, **sp. nov.** Type: Panama, Bocas del Toro, La Fortuna area, Gualaca to Chiriquí Grande, along oil pipeline road along continental divide W. of road, 1300 m, 08°45'N 82°17'W, 6 March 1986, *Hammel* et al. 14646 (MO!-holotype).
Fig. 2D–F.

Species foliis pinnatilobatus a congeneribus diversa.

*Herb* to 5 cm, perennial; epipetric. *Stem* repent, little branched, rooting at the base and adventitiously; internodes 4.5–12 × 0.4–0.8 mm, weakly striate, drying dark brown to black, sparsely pubescent, the hairs to 0.8 mm, weakly appressed, crooked or curved, cystoliths fusiform. *Stipules* 0.8–1.5 × 1.0–1.3 mm, auriculate, membranous, dark brown, persistent. *Laminas of leaves* at the same node of equal length or subequal, petiolate, 5.0–13.5 × 2.5–7.0 mm, ovate, pinnately lobed, membranous; adaxial surface drying green to brown-green, sparsely pubescent, the hairs to 0.5 mm, appressed, curved, cystoliths fusiform; abaxial surface drying grey-green, sparsely pubescent, the hairs to 0.5 mm, appressed, straight or curved, cystoliths absent, eglandular; base symmetrical or asymmetrical, decurrent and/or cuneate; margin entire; apex symmetrical, obtuse; primary venation pinnate, secondary veins 3–5 pairs, visible, 60° to the midrib; petioles unequal in pair by ratio 1:1.5–3.0, the major 2.5–4.0 × 0.3 mm, the minor 1.0–2.5 mm, sparsely pubescent, the hairs to 0.5 mm, erect, crooked. *Inflorescences* and intact *infructescences* not seen. *Fruit* 0.8–1.0 × 0.5 mm, asymmetrical, subcompressed, elliptic, brown, the margin broad, thickened.

DISTRIBUTION. Known only from the type collection from Chiriquí, Panama, growing at 1300 m on a rock face at the base of a waterfall.

This species falls into Weddell's *Dentatae* species group (with leaves of equal length at each node and toothed margins). *Pilea trichomanophylla* is named after its very distinctive leaves and habit

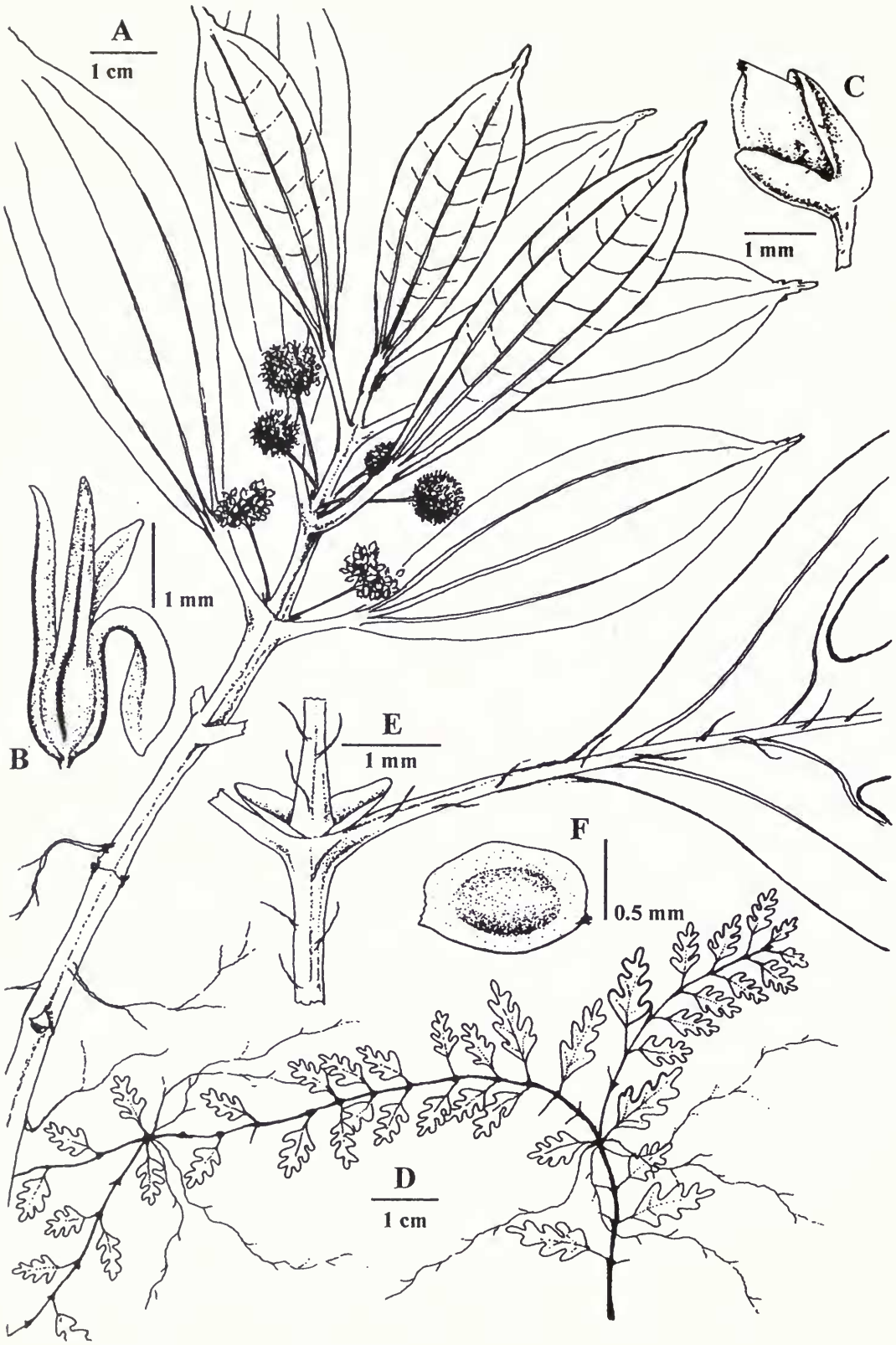


**Fig. 2** A–C. *Pilea adamsiana* (*Hammel* 4702, MO). A. Fertile branch with staminate inflorescences and infructescences, B. Staminate flower immediately prior to anthesis, C. Fruit. D–F. *Pilea trichomanophylla* (*Hammel* et al. 14646, MO). D. Fertile branch, E. Stipules, F. Fruit.

(Fig. 2D) which closely resemble those of some filmy ferns of the genus *Trichomanes*. It is the unmistakable nature of its leaves and the fact that it resembles no other known species from the neotropics which gives the author the confidence to publish this name as a new species despite the absence of flowers on the specimen. There is a remote possibility that the collection on which this description is based is of a precociously fertile plant of an already named species, the unusual leaf shape representing a developmental dimorphism. But this is deemed unlikely, and if it were the case, the sole species with the combination of repent form, small stipules, and isomorphic, toothed, pubescent leaves is *P. nummulariifolia* (Sw.) Wedd., and this species is not known from Cerro Tute, being typical of more open vegetation such as pine-oak formations. There are also morphological differences in stem colour, stipule texture and size, and leaf indumentum which would not be expected in a developmental dimorphism.

**ACKNOWLEDGEMENTS.** I thank Helen Greenop for preparing the illustrations, Norman Robson and Denis Adams for help with translating the Latin diagnoses, and Karen Sidwell and Bob Press for helpful comments on the manuscript. I also thank the curators at BRU, C, F, GH, ITIC, MEXU, MO, NY, P and US for the loan of specimens.

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